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MEMORANDUM **CH2MHILL**

Taylor Lumber and Treating Superfund Site - Soil Storage Cell Contained-In Determination

Introduction

The U.S. Environmental Protection Agency (EPA) is the lead agency for the Taylor Lumber and Treating Superfund Site located in Sheridan, Oregon, which is a fund-financed site. The remedy selected in the *Record of Decision, Taylor Lumber and Treating Superfund Site* (ROD) (U.S. EPA, 2005a), signed September 30, 2005, includes off-site disposal of soil at an acceptable disposal facility where cost-effective.

As part of the remedial action planned for this site, EPA has selected offsite disposal of soil currently located in three soil storage cells, referred to collectively as the "Soil Storage Cells." The soils in the storage cells are not structurally suitable for use as fill or cover at the site, so off-site disposal at a Subtitle D disposal facility, such as Waste Management's Riverbend Landfill in McMinnville, Oregon[1] is the preferred management option.

The purpose of this memorandum is three-fold:

- To document hazardous waste characterization of soils from Soil Storage Cells 1, 2, and 3 with respect to designation and current hazardous waste constituent concentrations;
- To provide the rationale and background required to support a "contained-in determination" for these soils that may contain waste codes F032, F034, and F035;
- To seek the Oregon Department of Environmental Quality's (ODEQ) review, as support agency, of the off-site disposal of soils at a Resource Conservation and Recovery Act (RCRA) Subtitle D disposal facility that is compliant with 40 CFR Part 258.

The soil storage cells were constructed during an EPA Time Critical Removal Action in 2000. Hazardous waste numbers that may be generally applicable to these soils, and the hazardous constituents for which the waste codes are listed (per 40 CFR Part 261, Appendix VII), are as follows:

- F032 - Benz(a)anthracene, benzo(a)pyrene, dibenz(a,h)-anthracene, indeno(1,2,3-cd)pyrene, pentachlorophenol, arsenic, chromium, tetra-, penta-, hexa-, heptachlorodibenzo-p-dioxins, tetra-, penta-, hexa-, heptachlorodibenzofurans.
- F034 - Benz(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, arsenic, chromium.
- F035 - Arsenic, chromium, lead.

[1] Riverbend Landfill is Subtitle D compliant, and accepts municipal solid waste, construction and demolition material, non-hazardous special waste, petroleum-contaminated soils, and recyclable materials.

These listing constituents are considered an adequate basis for a contained-in determination, because based on waste knowledge, the only sources of contamination in the soils are those associated with F032, F034, and F035 hazardous waste numbers.

The soils in the storage cells are not structurally suitable to be used as fill or cover at the site, and EPA has selected to dispose these soils at a Subtitle D disposal facility, such as Waste Management's Riverbend Landfill in McMinnville, Oregon[2]. In order to meet applicable criteria for Subtitle D disposal, EPA is making a contained-in determination, documenting that hazardous waste is no longer contained in these soils and that the soils do not exhibit a hazardous characteristic. This memorandum provides the necessary background information and rationale for the contained in determination for soils located in the soil storage cells.

Background

The Taylor Lumber and Treating Superfund Site is located in Sheridan, Yamhill County, Oregon. The Taylor Lumber and Treating Site was listed on the National Priorities List on June 14, 2001, and the EPA identification number for the site is ORD 0090 42532. The entire site is included in one operable unit (OU1).

Taylor Lumber and Treating (TLT) operated a sawmill from 1946 to 2001 in an area generally referred to as the East Facility. They conducted wood-treating operations from 1966 to 2001 in an area generally referred to as the West Facility (Figure 1). The predominant activity at TLT was the treatment of Douglas fir logs for utility poles and pilings. The primary wood-treating chemicals used by TLT included creosote, pentachlorophenol (PCP), and Chemonite (a solution of arsenic, copper, zinc and ammonia). Relevant waste codes for wood treating and associated processes using these chemicals are F032, F034, and F035. All operations ceased when TLT filed for bankruptcy in 2001. Pacific Wood Preserving of Oregon (PWPO) entered into a Prospective Purchaser Agreement with EPA and purchased the wood-treating West Facility (approximately 37 acres). They began wood-treating operations in June 2002. Other entities purchased the remaining portion of the former TLT holdings. The remedy identified in the ROD is for the West Facility. The West Facility refers to the former TLT's industrial property west of Rock Creek Road, including the Treatment Plant Area, White Pole Storage Area, Treated Pole Storage Area, and Soil Storage Cells. The designations of these areas reflect general property usage by the former TLT.

The primary areas of contamination at the TLT site include groundwater contamination beneath the Treatment Plant Area and surface soil contamination in the Treated Pole Storage Area. Contaminated groundwater and DNAPL, beneath the Treatment Plant Area, results from past drips, spills and leaks of wood-treating chemical from aboveground chemical storage tanks, drip pads, and tank farms.

EPA completed a removal action in 2000 that included the construction of a soil-bentonite slurry wall beneath the Treatment Plant Area to contain the DNAPL. Soils that were excavated during construction of the trench for the slurry wall were consolidated in Storage Cells 2 and 3, and soils from other interim and early measures are consolidated in Cell 1.

[2] Riverbend Landfill is Subtitle D compliant, and accepts municipal solid waste, construction and demolition material, non-hazardous special waste, petroleum-contaminated soils, and recyclable materials.

Remedial Investigation and Feasibility Study

EPA initiated the Remedial Investigation and Feasibility Study (RI/FS) in April 2001. The Phase 1 RI Report (evaluation of nature and extent based on existing data) was completed in January 2002 (CH2M HILL, 2002), and the Phase 2 RI (field investigation needed to fill data gaps for the RI/FS) was conducted in 2002 and 2003 (CH2M HILL, 2004). The RI Report summarizes the site investigation activities and presents data on the nature and extent of contamination at the site. RI data were used to conduct a baseline human health risk assessment and ecological risk assessment (CH2M HILL, 2004).

The FS was conducted in 2003 and 2004. The FS Report describes the development and evaluation of remedial action alternatives for affected soil and groundwater. The RI/FS was finalized in May 2005.

Selected Remedy

The *Proposed Plan for the Taylor Lumber and Treating Superfund* (U.S. EPA 2005b) was released for formal public comment on July 28, 2005. The public comment period closed on August 26, 2005. EPA finalized the Record of Decision (ROD) on September 30, 2005.

The final remedy selected for the site in the ROD is designed to protect human health and the environment by containing and preventing contact with the wastes from the former wood-treating facility. The selected remedy for contaminated surface soil, including the Soil Storage Cells, follows:

> *Excavation or capping and consolidation of contaminated soils located within the West Facility and in ditches that abut the West Facility (in coordination with applicable state and federal regulations). If cost-effective, excess soil that is not consolidated onsite may be sent offsite to an acceptable disposal facility.*

At the time this alternative was developed during the FS process, the offsite disposal option was more than 10 times more costly than onsite consolidation and capping. Recent quotes for disposal at Arlington hazardous waste landfill are substantially reduced, however, and offsite disposal of contaminated soils has been selected instead of onsite consolidation.

If in compliance with federal regulations, EPA will dispose the minimally contaminated soil from Cells 1, 2, and 3 at a permitted Subtitle D facility, such as Riverbend Landfill.

History of Soil Storage Cells

The three Soil Storage Cells (Cell 1, 2 and 3) are located in the northwest corner of the site. The storage cells were created in 2000 during the time critical removal action by consolidation of existing stockpiles and soil resulting from removal action activities. These soils are all considered to be consolidated within a single Area of Concern, and as such, they are not considered to have been generated with respect to applicability of LDR treatment standards. The cells were constructed with a 40-mil high-density polyethylene liner anchored with 2 feet of clean soil and covered with a 12-mil Duraskrim® liner, affording temporary containment.

The three separate stockpiles of soil originated from different locations with different histories. According to the Removal Action Report (E&E, 2001) the source of soil in each Storage Cell is as follows:

- *Soil Storage Cell 1* was filled with the stockpiled soil from the Treatment Plant area. This included some of the soils excavated during the September 1999 emergency response, the installation of the stormwater conveyance system, the stormwater treatment system, and the ditch cleaning effort in the Removal Action to remove areas elevated in arsenic.
- *Soil Storage Cell 2* was filled with excavated soil from the soil-bentonite barrier wall trench installation (surface to approximately 17 to 21 ft bgs) that was constructed to contain the DNAPL plume beneath the Treatment Plant Area.
- *Soil Storage Cell 3* was filled with soil excavated during the installation of the protective cap that was constructed over the barrier wall.

The soil-bentonite barrier wall was constructed outside of the known limits of the DNAPL plume and subsurface soil contamination, and therefore levels of contamination in soil excavated during the wall installation were expected to be low. This assumption has since been supported by sampling data, as summarized below.

In July 2005, EPA conducted an interim action excavating approximately 140 cubic yards (yd^3) of soil from ditches on the east side of Rock Creek Road. An access ramp was constructed on the south side of Cell 2, and the soil from the ditch excavation was placed on top of the liner over a small portion of Cell 2. The stockpile was then covered with a plastic liner and anchored with weights. This soil is segregated from the Cell 2 soil and will be handled separately, and therefore is not addressed in this memorandum.

Soil Storage Cell Volume

The volume of each of the storage cells was estimated using a digital terrain model (DTM) and aerial photogrammetry obtained from the 2006 field survey (CH2M HILL, 2006). The volumes of soil in each cell are summarized in Table 1. A breakdown of the volume of soil contained in the three storage cells, and the volume of clean soil comprising the perimeter berms, access road and ramps is also provided.

TABLE 1
Soil Storage Cell Volume Estimates
Taylor Lumber and Treating Design Basis Report, Sheridan, Oregon

Soil Storage Cell	Total Volume (yd^3)	Volume of Clean Soil in Berms and Road (yd^3)	Estimated Contaminated Soil Volume (yd^3)
1	6080	1280	4800
2	8100	3140	4960
3	6040	2990	3050
Ditch Soil Stockpile[1]	140	--	140
Totals:	**20,360**	**7410**	**12,950**

Notes: [1]140 yd^3 of soil from the 2005 ditch excavation, stockpiled on cover of Cell 2. This volume is not part of the contained-in determination.

Soil Storage Cell Characterization Data

Multiple sampling events have been completed to characterize the constituents in soil storage cell soils.

In December 1999, four composite samples from the stockpiled soil that was to fill Cell 1 were collected and analyzed for semivolatile organic compounds (SVOCs) and toxicity characteristic leaching procedure (TCLP) arsenic (E&E 2001). In January 2000, additional samples were collected and analyzed for dioxins.

After the soil storage cells were constructed in 2000, 4 composite samples were collected from Cell 2 and 7 composite samples were collected from Cell 3. The composite soil samples were collected and analyzed for metals and SVOCs. Each sample consisted of a composite from three locations. At each location, equal volumes of soil were collected at depths of 1 foot, 3 to 5 feet, and 5 to 8 feet. Each composite sample represented approximately 1,000 cubic yards of soil (E&E 2001).

During the field investigation in 2002, four composite samples (one each from Cells 1 and 3, and two from Cell 2) were collected (subsampled from a composite of four geoprobes, generally at depths of 0 to 5 ft) and analyzed for metals, total PCP and PAHs, and SVOCs by the TCLP. One sample (from Cell No. 3) was analyzed for dioxins/furans.

Table 2 provides a summary of analytical data for SVOCs and metals resulting from these sampling events. The data are considered to be representative of the soil in Cells 1, 2 and 3 because soil in the stockpiles are from known locations and a similar operation, sample locations were randomly and equally placed throughout the stockpile, samples were collected using a composite approach which provides information on average concentrations in the stockpile, and observations of the soil in the stockpile record that soil appears homogeneous in color, texture, and size.

In addition to specific data results collected from the Cell 1, 2, and 3, knowledge about the source of the soils placed in the storage cell is relevant:

- Cell 1 is filled with soil excavated from soil stockpiles from the Treatment Plant area, ditch cleaning efforts and from construction of the stormwater treatment system which is located in the southeast corner of the site, an area with lower contaminant concentrations. Cell 1 also includes tree bark that was stored onsite at the time of construction. This bark was stripped from trees prior to drying and treatment.

- Cell 2 is filled with soil excavated from trench construction (surface to approximately 17 to 21 ft below ground surface [bgs]) during installation of the soil-bentonite slurry wall at the site.

- Cell 3 is filled with soil excavated from the soil-bentonite slurry wall protective cap installation. The excavation for construction of the protective cap was from 0 to 2.5 ft bgs and approximately 13.5 feet wide along the centerline of the slurry wall.

- Existing soil data collected from the site indicate that the soils that were excavated during slurry wall trench construction are likely to have very low contaminant concentrations:
    - Surface and subsurface soil data collected from locations in the vicinity of the slurry wall show very low concentrations of contaminants.
        - Arsenic Data near the Barrier Wall: Arsenic concentrations are less than 16 ppm (background is estimated at 12 ppm) at all but one location (TP-11) sampled in the vicinity of the barrier wall (see surface and subsurface sample results plotted on Figure 4-3 of the RI/FS). At TP-11, the surface arsenic concentration was 39.5 ppm and subsurface arsenic concentrations were reported at 6.3 ppm (4-6 ft) and 2.7 ppm (6-8 ft).
        - Arsenic Data at the Site: Of the 100 deep [below 2 feet] soil samples analyzed for arsenic across the site, only 9 exceeded 12 ppm. Of the two deep samples collected from inside the barrier wall, the maximum concentration was 23 ppm.
        - PCP: In the ROD, PCP was not identified as a chemical of concern in soils. Throughout the West Facility, few samples at any depth showed PCP exceedances, and only one sample exceeded the Region 9 Industrial (10^{-6}) soil PRG of 9 ppm by more than 10-fold. This sample, located in the Treated Pole Storage Area, was collected within the surface 2 feet.
    - Surface and subsurface soil data collected from locations outside the slurry wall showed that with few exceptions, contaminants were not found at depth. The only location where significant subsurface soil contamination was observed was associated with DNAPL inside the barrier wall in the West Facility.
    - During construction of the barrier wall, no obvious signs of soil contamination (e.g., stained soils, LNAPL, DNAPL) were observed in the excavated soils (E&E 2001).

Hazardous Waste Determination

Prior to offsite disposal of storage cell soils, soil characterization data, site history, dates of operation and process knowledge must be used to determine if these soils contain hazardous waste. A waste must be assessed to determine if it is a listed waste (generated from a specific process) or characteristic waste (ignitable, corrosive, reactive or contains leachable toxic materials). If a waste is neither listed nor characteristic, it may be managed as a nonhazardous waste (though other provisions may apply).

Assessment for Listed Waste

Soils removed from wood treating sites during remediation are commonly from waste ponds, lagoons or other areas known to have received waste materials from sources enumerated in the listing definitions of the F032, F034 and F035 hazardous waste numbers.

Such wastes and residuals in soil are classified under RCRA as F032, F034, or F035 listed wastes based on the wood preserving formulations used at the facility and generating processes. F032 wastes are defined in 40 CFR Part 261.31 as:

> "Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations"

F034 and F035 wastes are similarly defined for facilities that use or have used creosote formulations and inorganic preservatives containing arsenic and chromium, respectively.

Considering the soils contained in the Soil Storage Cells were excavated from portions of the West Facility that contain the retorts, Treatment Plant Area, tank farms and drip pads, it is reasonable to assume that process residuals, preservative drippage and spent formulations may have contributed to the soil contamination. For purposes of this evaluation, to speed review and processing of these soils, we have considered the soil in Cells 1, 2, and 3 to be potentially contaminated by waste codes F032, F034, and F035.

Assessment for Characteristic Waste

Based on process knowledge of the TLT operation, site observations, and analytical results of soil samples, soils in Cell 1, 2, and 3 do not contain toxic contaminants other than those in the listing basis for F032, F034, and F035. As a result, there is no expectation that hazardous waste constituents other than listed constituents are present.

Contained-In Determination

This memorandum establishes a contained-in determination for the soils in Cells 1, 2, and 3. EPA's guidance, *Management of Remediation Waste Under RCRA* (U.S. EPA, 1998b) states that "EPA generally considers contaminated environmental media to contain hazardous waste: (1) when they exhibit a characteristic of hazardous waste; or (2) when they are contaminated with concentrations of hazardous constituents from listed hazardous waste that are above health-based levels." This guidance goes on to say "In the case of media that are contaminated by listed hazardous waste, current EPA guidance recommends that contained-in determinations be made based on direct exposure using a reasonable maximum exposure scenario and that conservative, health-based, standards be used to develop the site-specific health-based levels of hazardous constituents below which contaminated media would be considered to no longer contain hazardous waste."

Based on this guidance, this memorandum identifies health-based standards for comparison to analytical results of storage cell soils. This evaluation uses ODEQ's risk based concentrations (RBCs) for industrial soil for the construction worker scenario, assuming a target risk of 1×10^{-6} (ODEQ, 2003). This approach has been recommended to EPA by the Oregon Department of Environmental Quality, and is specific to such determinations in the state of Oregon. EPA believes that the construction worker scenario is a reasonable maximum exposure scenario for soils for purposes of evaluating whether or not there is a basis for a contained-in determination predicated upon disposal in a RCRA Subtitle D permitted landfill facility. This approach does not necessarily represent the actual risk of the contaminated soils in a Subtitle D landfill, only whether there is a basis to conditionally

manage the contaminated soils in a Subtitle D landfill outside of the RCRA Subtitle C program through a contained-in determination. Table 3 provides a comparison of the calculated 90% Upper Confidence Limit of the sample mean (UCL) for analytical data from Cells 1, 2, and 3 soils with the Industrial RBCs for the construction worker scenario. (For some of the analytes insufficient data are available to calculate UCLs, in those cases the maximum detection is used.)

Table 3 demonstrates that the 90% UCLs are below the respective 10^{-6} RBCs for individual hazardous constituents. In addition, the cumulative carcinogenic risk to the construction worker was calculated and found to be less than 1×10^{-5}. ODEQ considers acceptable risk as 1×10^{-6} for individual carcinogens, and 1×10^{-5} for multiple carcinogens.

Since the soils in question are not proposed for on-site disposal, no evaluation of environmental receptors or risks to environmental receptors is necessary in the context of making a contained-in determination.

Based on knowledge about the source of the soils, the low levels of contamination for SVOCs, metals and dioxins/furans, the favorable comparison to conservative health-based standards, and conditioned on the planned disposal in a permitted solid waste landfill, EPA believes that a contained-in determination for Cells 1, 2, and 3 soils is warranted.

Conclusions

The analysis presented in this memorandum indicates that soils in Soil Storage Cells 1, 2, and 3 are reasonably likely to have been contaminated with listed hazardous waste. The available hazardous waste constituent concentration data indicate that the soil is not a characteristic hazardous waste, and exhibits an acceptable risk when evaluated against a reasonable maximum exposure scenario. Therefore, this memorandum establishes the determination that the soils in question no longer contain listed hazardous waste, conditioned on final disposal in a state-authorized RCRA Subtitle D facility. Based on this assessment, EPA will dispose of these soils at a permitted RCRA Subtitle D facility, such as the Riverbend Landfill in McMinnville, Oregon.

References

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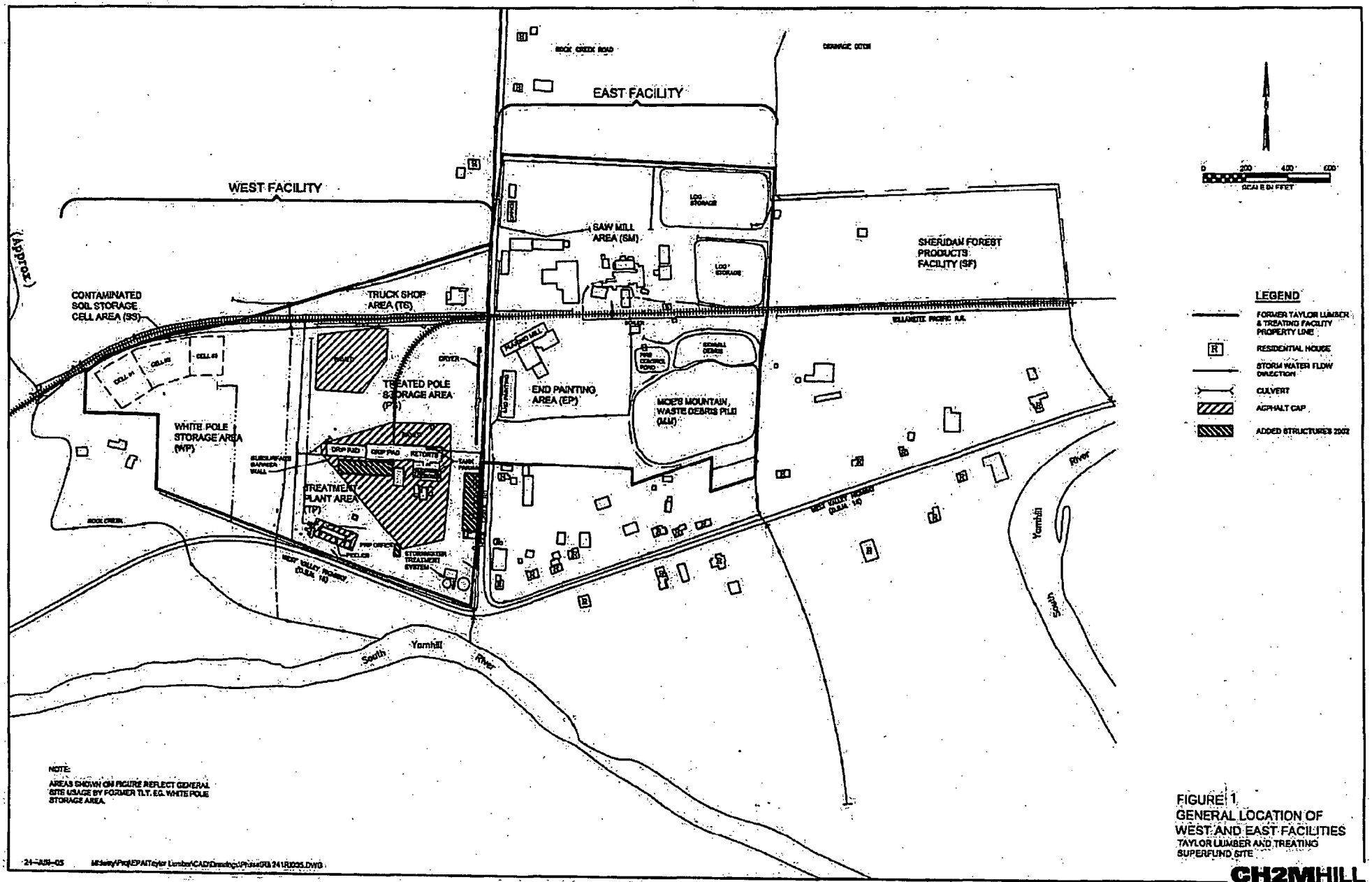

FIGURE 1
GENERAL LOCATION OF WEST AND EAST FACILITIES
TAYLOR LUMBER AND TREATING SUPERFUND SITE

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Table 2
Soil Storage Cell Soil Data Summary
Taylor Lumber and Treating Superfund Site

Chemical of Concern	Applicable Waste Code	Cell 1				Cell 2				Cell 3			
		Min		Max		Min		Max		Min		Max	
SVOCs (mg/kg)													
Benzo(a)anthracene	(F032, F034)	0.32	J	1.5	=	0.018	U	0.37	=	0.38	=	4.9	=
Benzo(a)pyrene	(F032, F034)	0.38	U	1	=	0.075	=	0.5	=	0.22	=	2.7	=
Benzo(k)fluoranthene	(F034)	0.3	J	0.71	=	0.098	=	0.3	=	0.24	=	2	=
Dibenz(a,h)anthracene	(F032, F034)	0.024	U	0.075	=	0.011	J	0.025	J	0.015	U	0.25	=
Indeno(1,2,3-cd)pyrene	(F032, F034)	0.025	J	0.36	J	0.037	=	0.25	=	0.089	=	0.88	=
Naphthalene	(F034)	1	=	19	=	0.011	J	0.029	=	0.018	=	0.089	=
Pentachlorophenol	(F032)	1.5	=	48	=	0.62	J	4.5	=	6.6	J	21	=
Metals (mg/kg)													
Arsenic	(F032, F034, F035)	na		28	=	2.3	U	16	=	11	=	27	=
Chromium	(F032, F034, F035)	na		24	=	29	=	53	=	25	=	60	J
Lead	(F035)	na		6	=	5.4	=	6.7	=	4.4	J	13	J
Dioxins/furans (mg/kg)													
1,2,3,4,6,7,8-HpCDD	(F032)	0.002284	=	0.019071	=	na		na		na		0.028090	J
1,2,3,4,7,8-HxCDD	(F032)	0.000264	U	0.000415	U	na		na		na		0.000137	=
1,2,3,6,7,8-HxCDD	(F032)	0.000149	J	0.000491	=	na		na		na		0.001090	=
1,2,3,7,8,9-HxCDD	(F032)	0.000137	J	0.000347	U	na		na		na		0.000340	=
1,2,3,7,8-PeCDD	(F032)	0.000204	U	0.000324	U	na		na		na		0.000053	=
2,3,7,8-TCDD	(F032)	0.000036	U	0.000102	U	na		na		na		0.000004	=
OCDD	(F032)	0.023233	=	0.188244	=	na		na		na		0.140000	J
TEQ	–	0.000033	=	0.000334	=	na		na		na		0.000645	=
1,2,3,4,6,7,8-HpCDF	(F032)	0.000278	=	0.002217	=	na		na		na		0.003120	J
1,2,3,4,7,8,9-HpCDF	(F032)	0.000197	U	0.000308	U	na		na		na		0.000158	=
1,2,3,4,7,8-HxCDF	(F032)	0.000085	U	0.000133	U	na		na		na		0.000266	=
1,2,3,6,7,8-HxCDF	(F032)	0.000076	U	0.000118	U	na		na		na		0.000096	=
1,2,3,7,8,9-HxCDF	(F032)	0.000086	U	0.000134	U	na		na		na		0.000000	U
1,2,3,7,8-PeCDF	(F032)	0.000117	U	0.000208	U	na		na		na		0.000001	U
2,3,4,6,7,8-HxCDF	(F032)	0.000084	U	0.000131	U	na		na		na		0.000171	=
2,3,4,7,8-PeCDF	(F032)	0.000104	U	0.000185	U	na		na		na		0.000063	=
2,3,7,8-TCDF	(F032)	0.000021	U	0.000036	U	na		na		na		0.000016	=
OCDF	(F032)	0.001106	=	0.005235	=	na		na		na		0.008800	J

NOTES
1. Minimum and Maximum values are a summary of samples taken from Cell 1, 2, and 3 Soils (with the exception of Dioxin/Furan data for Cell 1) in November 2000 and August 2002.
2. Data for Cell 1 Dioxin/Furan congeners is provided in Removal Action Report, Appendix C (E&E 2001).

NOTATION KEY
"=" = Analyte was positively identified
J = Analyte was positively identified. Result is an estimate.
U = Analyte was not detected. Result is the sample quantitation limit.
na = not available

Table 3

Comparison of Cell Soil Data to Health Based Concentrations
Taylor Lumber and Treating Superfund Site

Chemical of Concern	Applicable Waste Code	Cell 1 90% UCL [1,2,3]	Cell 2 90% UCL	Cell 3 90% UCL [4]	Combined Cells 1-2-3 90% UCL	ODEQ 10^{-6} Risk Based Concentration (RBC): Construction Worker [5,6]	Does Combined Cells 90% UCL Exceed RBC?	Calculate Aggregate Risk[7]: 90%UCL/ RBC
SVOCs (mg/kg)								
Benzo(a)anthracene	(F032, F034)	1.23	0.235	2.32	1.29	21	No	0.0613
Benzo(a)pyrene	(F032, F034)	0.705	0.368	1.23	0.679	2.1	No	0.3232
Benzo(k)fluoranthene	(F034)	0.579	0.201	0.939	0.546	21	No	0.0260
Dibenz(a,h)anthracene	(F032, F034)	0.064	0.159	0.156	0.087	2.1	No	0.0413
Indeno(1,2,3-cd)pyrene	(F032, F034)	0.308	0.158	0.479	0.287	21	No	0.0137
Naphthalene	(F034)	16.77	0.024	0.055	4.68	710	No	–
Pentachlorophenol	(F032)	40.10	3.33	15.63	19.68	181	No	0.1087
Metals (mg/kg)								
Arsenic	(F032, F034, F035)	28	9.53	22.88	18.01	85.2	No	0.2114
Chromium	(F032, F034, F035)	24	48.15	41.10	41.25	5404	No	–
Lead	(F035)	6	6.26	8.10	6.98	750	No	–
Dioxins/furans (mg/kg)								
1,2,3,4,6,7,8-HpCDD	(F032)	0.019071	na	0.028090	0.028090	0.0367705	No	0.7639
1,2,3,4,7,8-HxCDD	(F032)	ND	na	0.000137	0.000137	0.0036771	No	0.0373
1,2,3,6,7,8-HxCDD	(F032)	0.000491	na	0.001090	0.001090	0.0036771	No	0.2964
1,2,3,7,8,9-HxCDD	(F032)	0.000137	na	0.000340	0.000340	0.0036771	No	0.0925
1,2,3,7,8-PeCDD	(F032)	ND	na	0.000053	0.000053	0.0003677	No	0.1428
2,3,7,8-TCDD	(F032)	ND	na	0.000004	0.000004	0.0003677	No	0.0098
OCDD	(F032)	0.188244	na	0.140000	0.188244	1.2256837	No	0.1536
1,2,3,4,6,7,8-HpCDF	(F032)	0.002217	na	0.003120	0.003120	0.0367705	No	0.0849
1,2,3,4,7,8,9-HpCDF	(F032)	ND	na	0.000158	0.000158	0.0367705	No	0.0043
1,2,3,4,7,8-HxCDF	(F032)	ND	na	0.000266	0.000266	0.0036771	No	0.0723
1,2,3,6,7,8-HxCDF	(F032)	ND	na	0.000096	0.000096	0.0036771	No	0.0260
1,2,3,7,8,9-HxCDF	(F032)	ND	na	ND	ND	0.0036771	No	0.0000
1,2,3,7,8-PeCDF	(F032)	ND	na	ND	ND	0.0122568	No	0.0000
2,3,4,6,7,8-HxCDF	(F032)	ND	na	0.000171	0.000171	0.0036771	No	0.0465
2,3,4,7,8-PeCDF	(F032)	ND	na	0.000063	0.000063	0.0012257	No	0.0512
2,3,7,8-TCDF	(F032)	ND	na	0.000016	0.000016	0.0036771	No	0.0045
OCDF	(F032)	0.005235	na	0.008800	0.008800	1.2256837	No	0.0072
Summation of Aggregate Risk								**2.5787**

NOTES

1. Oregon Department of Environmental Quality (ODEQ) guidance specifies use of the 90% UCL (Oregon Department of Environmental Quality, Guidance for the Conduct of Deterministic Human Health Risk Assessments (ODEQ, 2000).
2. Arsenic, chromium and lead values for Cell 1 are from single samples.
3. All dioxin/furan congener values for Cell 1 represent the maximum detect for 3 samples. 90% UCLs are not calculated due to insufficient number of data points.
4. All dioxin/furan congener values for Cell 3 are from single samples.
5. ODEQ risk-based concentrations for selected SVOCs and Metals are provided in Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites (ODEQ, 2003).
6. ODEQ risk-based concentrations for pentachlorophenol, arsenic, chromium, and individual dioxin/furan congeners were calculated based on (ODEQ, 2003) default exposure assumptions for the construction worker scenario.
7. To calculate aggregate risk divide 90%UCL (or maximum detect for dioxins) by RBC for each carcinogen. The summation of all quotients yields 2.59×10^{-6}. DEQ's target aggregate cancer risk is 10^{-5}. Cr, Pb and naphthalene are not considered carcinogens so are not included in this calculation.

NOTATION KEY

J = Analyte was positively identified. Result is an estimate.
U = Analyte was not detected. Result is the sample quantitation limit.
UCL = Upper Confidence Limit
na=not available